

CLAIMS

What is claimed is:

1 1. An optical disc discrimination apparatus for use in an optical disc reproducer which
2 reproduces data from a plurality of different types of discs with a single optical pickup, the
3 optical disc discrimination apparatus comprising:

4 an RF envelope generator which generates an envelope signal from an RF signal read
5 from one of the discs which is loaded in the optical disc reproducer; and

6 a controller which detects an amplitude of the envelope signal at an off-track state of the
7 loaded disc, and discriminates the type of the loaded disc using the detected amplitude. ✓

1 2. The optical disc discrimination apparatus of claim 1, wherein said RF envelope
2 generator generates the envelope signal by a peak hold and a bottom hold of the RF signal read
3 from the loaded disc.

1 3. The optical disc discrimination apparatus of claim 1, wherein said off-track state is a
2 state where only a focusing is accomplished before a tracking control of the loaded disc is
3 performed.

1 4. The optical disc discrimination apparatus of claim 3, wherein said controller
2 comprises:
3 an envelope amplitude detector which detects the amplitude of the envelope signal; and
4 a disc discriminator which compares a level of the detected amplitude with at least one
5 predetermined reference level and discriminates whether the loaded disc is a CD, a DVD-
6 ROM, or a DVD-RAM, based on the comparison.

1 5. The optical disc discrimination apparatus of claim 4, wherein said envelope
2 amplitude detector samples the envelope signal between a maximum value and a minimum
3 value into n sample signals at a zero cross interval, and obtains an average value of the

4 obtained n peak-to-peak values as the detected amplitude.

1 6. The optical disc discrimination apparatus of claim 4, wherein said at least one
2 predetermined reference level is set based on conditions that a CD has a track pitch relatively
3 larger than a DVD-ROM, thus having a larger change in the amplitude of the RF signal as an
4 optical beam emitted by the optical disc reproducer traverses tracks thereof, and that a DVD-
5 RAM has no change in the amplitude of the RF signal as the optical beam emitted by the
6 optical disc reproducer traverses the tracks thereof.

1 7. The optical disc discrimination apparatus of claim 6, wherein said disc discriminator
2 discriminates whether:

3 the loaded disc is the CD if a level of the detected envelope amplitude is larger than a
4 first one of the at least one predetermined reference level;

5 the loaded disc is the DVD-ROM if the level of the detected envelope amplitude is
6 smaller than the first predetermined reference level and larger than a second one of the at least
7 one predetermined reference level; and

8 the loaded disc is the DVD-RAM if the level of the detected envelope amplitude is
9 smaller than the second predetermined reference level.

1 8. The optical disc discrimination apparatus of claim 5, wherein said envelope
2 amplitude detector detects a magnitude of peak-to-peak values of the n sample signals, and
3 obtains the average value of the peak-to-peak values to determine the detected amplitude.

1 9. The optical disc discrimination apparatus of claim 8, wherein said envelope
2 amplitude detector obtains the average value, represented by ENV_{p-p}, in accordance with the
3 equation:

$$ENV_{p-p} = \frac{\sum [ENV_{max} \cdot ENV_{min}]}{n} \dots (1)$$

5 wherein n is the predetermined number of samples, ENV_{max} is the maximum value
6 and ENV_{min} the minimum value.

1 10. The optical disc discrimination apparatus of claim 3, wherein said controller
2 controls rotation of the loaded disc at a speed slow enough to maintain a focusing state with
3 respect to each of the plurality of different types of discs in the off-track state.

1 11. The optical disc discrimination apparatus of claim 4, wherein said controller
2 controls rotation of the loaded disc at a speed slow enough to maintain a focusing state with
3 respect to each of the CD, DVD-ROM and DVD-RAM in the off-track state.

1 12. An optical disc discrimination method of discriminating a type of a disc for use in
2 an optical disc reproducer which reproduces data from a plurality of discs with only a single
3 optical pickup, the optical disc discrimination method comprising:

4 (a) obtaining an envelope signal from a RF signal detected from one of discs which is
5 loaded in the optical disc reproducer at an off-track state of the loaded disc;

6 (b) detecting an amplitude of the envelope signal;

7 (c) comparing the amplitude of the envelope signal with at least one predetermined
8 reference level; and

9 (d) discriminating whether the loaded disc is a CD, a DVD-ROM, or a DVD-RAM
10 based on the comparison.

1 13. The optical disc discrimination method of claim 12, wherein said step (b)
2 comprises:
3 sampling the envelope signal between a maximum value and a minimum value into a
4 predetermined number of sample signals at a zero-cross interval;
5 detecting the predetermined number of sample signals; and
6 obtaining an average value of the detected predetermined number of sample signals to
7 detect the amplitude.

1 14. The optical disc discrimination method of claim 12, wherein said step (d)
2 comprises discriminating the loaded disc as the CD, the DVD-ROM or the DVD-RAM, based
3 upon a condition that a change in the RF signal amplitudes as an optical beam of the optical
4 disc reproducer moves across tracks thereof differs from each other in the CD, the DVD-
5 ROM, and the DVD-RAM, wherein,
6 a first one of the at least one predetermined reference level is larger than the amplitude
7 of the RF signal detected from the CD, and
8 a second one of the at least one predetermined reference level is smaller than the first
9 predetermined reference level and larger than the amplitude of the RF signal detected from the
10 DVD-ROM.

1 15. The optical disc discrimination method of claim 14, wherein said step (d)
2 comprises:
3 discriminating that the loaded disc is the CD if the amplitude of the envelope signal
4 detected from the RF signal is larger than the first predetermined reference level;
5 discriminating that the loaded disc is the DVD-ROM if the amplitude of the envelope
6 signal detected from the RF signal is smaller than the first predetermined reference level and
7 larger than the second predetermined reference level; and
8 discriminating that the loaded disc is the DVD-RAM if the amplitude of the envelope
9 signal detected from the RF signal is smaller than the second predetermined reference level.

16. The optical disc discrimination method of claim 13, wherein:
the detecting of the predetermined number of sample signals comprises detecting a
magnitude of peak-to-peak values of the predetermined number of samples; and
the obtaining of the average value comprises obtaining the average value of the peak-to-
peak values to detect the amplitude of the envelope signal.

17. The optical disc discrimination method of claim 16, wherein the obtaining of the average value, represented by ENVp-p, is determined in accordance with the equation:

$$ENVp - p = \frac{\sum [ENV \max - ENV \min]}{n} \dots (1)$$

wherein n is the predetermined number of samples, ENV_{max} is the maximum value and ENV_{min} is the minimum value.

18. The optical disc discrimination method of claim 12, further comprising controlling a rotation of the loaded disc at a speed slow enough to maintain a focusing state with respect to each of the plurality of different types of discs in the off-track state.

19. The optical disc discrimination method of claim 13, further comprising controlling a rotation of the loaded disc at a speed slow enough to maintain a focusing state with respect to each of the CD, DVD-ROM and DVD-RAM in the off-track state.

1 20. An optical reproducer which reproduces data from a plurality of different types
2 of discs using a single optical pickup, the optical disc discrimination apparatus comprising:
3 a data reproducing device which reproduces the data by illuminating an optical beam on
4 a loaded one of the optical discs, receive the reflected optical beam, to generate an RF signal;
5 an RF envelope generator which generates an envelope signal from the RF signal; and
6 a controller which detects an amplitude of the envelope signal only when a focusing
7 operation of the disc is being performed prior to a tracking control operation of the disc is
8 being performed, to discriminate the type of the loaded disc, wherein the controller controls
9 the reproduction of the disc in accordance with the discriminated disc type.

1 21. The optical reproducer of claim 20, wherein said controller comprises:
2 an envelope amplitude detector which detects an amplitude of the envelope signal; and
3 a disc discriminator which compares a level of the detected amplitude with at least one
4 predetermined reference level and discriminates whether the loaded disc is a CD, A DVD-
5 ROM, or a DVD-RAM, based upon the comparison.

1 22. The optical reproducer of claim 20, wherein said controller controls rotation of
2 the loaded disc at a speed slow enough to maintain a focusing state with respect to each of the
3 plurality of different types of discs during the focusing operation.

1 23. The optical reproducer of claim 20, wherein the optical beam is initialized to
2 635-650 nm during the focusing operation of the disc performed prior to the tracking control
3 operation of the disc.

1 24. The optical reproducer of claim 20, further comprising:
2 an RF amplifier to amplify the RF signal output from the data reproducing device;
3 a focusing servo to output a focus control signal in accordance with a focus error signal
4 of the RF signal and the discriminated disc type;
5 a pickup actuator to drive the data reproducing device for focusing based upon the

6 focus control signal;
7 a spindle motor to rotate the loaded disc in accordance with a servo control signal; and
8 a spindle servo to generate the servo control signal in accordance with the discriminated
9 disc type and the amplified RF signal.

1 25. An optical disc reproduction method of reproducing data from a plurality of
2 different types of discs using a single optical pickup, the optical disc reproduction method
3 comprising:
4 reproducing the data by illuminating an optical beam on a loaded one of the optical
5 discs, receive the reflected optical beam, to generate an RF signal;
6 generating an envelope signal from the RF signal; and
7 detecting an amplitude of the envelope signal only when a focusing operation of the disc
8 is being performed prior to a tracking control operation of the disc is being performed, to
9 discriminate the type of the loaded disc, and controlling the reproduction of the disc in
10 accordance with the discriminated disc type.

1 26. The optical disc reproduction method of claim 25, wherein the discriminating of
2 the type of disc comprises comparing a level of the detected amplitude with at least one
3 predetermined reference level and discriminating whether the loaded disc is a CD, A DVD-
4 ROM, or a DVD-RAM, based upon the comparison.

1 27. The optical disc reproduction method of claim 25, further comprising
2 controlling rotation of the loaded disc at a speed slow enough to maintain a focusing state with
3 respect to each of the plurality of different types of discs during the focusing operation.

1 28. The optical disc reproduction method of claim 25, further comprising initializing
2 the optical beam to 635-650 nm during the focusing operation of the disc performed prior to
3 the tracking control operation of the disc.